THE NATURE CONSERVANCY NEWS

January/February 1982

WHY SAVE DIVERSITY?

Endangered, not extinct:

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THE NATURE CONSERVANCY NEWS

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COVER: Endangered Florida manatees (*Trichechus manatus*) at the Conservancy's Crystal River Manatee Project —critical habitat currently under option by the Florida Chapter. Fundraising sights are set at $425,000. Photo by Pat Rose, Florida Audubon.

The Nature Conservancy is a national conservation organization committed to the preservation of natural diversity by protecting lands containing the best examples of all components of our natural world.

To date the Conservancy and its members have been responsible for the preservation of 1,845,982 acres of forests, marshes, prairies, mountains, and islands: home to rare and endangered species of wildlife and plants. 2,812 projects have been completed since the acquisition of the first preserve in 1954. Approximately 60% of all preserves are retained by the Conservancy and managed by volunteer land stewards.

A membership, non-profit organization, the Conservancy was incorporated in 1951 in the District of Columbia for scientific and educational purposes.

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ON SAVING DIVERSITY

by G. Jon Roush

WE HAVE ONLY a rough idea of how many species inhabit the earth, perhaps as many as 10 million. But we do know that they are vanishing at an alarming rate. Normally, existing species become extinct at approximately the same rate as new species evolve, but since the year 1600 that equation has grown increasingly lopsided. Informed estimates put the present extinction rate at 40 to 400 times normal. One estimate says 25,000 species are in danger right now.

Whooping cranes

Another says that 1 million could disappear from South America alone in the next two decades. If current trends continue, some 20 percent of the species now on earth will be extinct by the year 2000. Current trends will probably continue.

This awesome rate of extinction is apparently unprecedented in our planet's history. Many experts say it represents our most alarming ecological crisis. Yet where are the headlines, the congressional hearings, the calls to action? Does no one care? Do we expect someone else to solve the problem, or does it seem so immense as to defy solution? It is time to take stock of our own attitudes and possibilities for change.

To begin, we need to understand the problem. What difference does it really make if we hasten the process of extinction and lose some species of clam, or if we plow the last remaining example of some prairie type? The reasons for protecting natural diversity are complex, but they boil down to

four arguments. Each argument stands on its own. If you accept one of them, you have accepted the urgent need to preserve the current spectrum of species and ecosystems.

FIRST, REDUCING DIVERSITY can weaken whole natural systems. For example, what's the use of alligators? For ages, alligators have snoozed, bred, and fed in "gator holes," large depressions scooped out of the ground by the alligator. These holes fill with water to form permanent pools, and each pool houses its own world of algae, ferns and other plants, fish and amphibians. In fact, some of them are fed by droppings and bits of food left by the alligator. In dry years these gator holes and the trails between them form the only sanctuary for many of the creatures of the Florida Everglades. Then when the rains return, the sheltered creatures can move out to repopulate the area.

Near the gator hole itself, the female alligator makes a large nest of sticks and mud. Each year she adds new material. Over the years, these nests grow to form dry islands, supporting trees that provide nesting places for herons and other birds. Although the alligator at the bottom of the tree may eat an occasional chick, it is also an unwitting sentinel, keeping tree-climbing predators away from the birds' nests.

When the alligators themselves fell prey to man's whim to have shoes and handbags made from their hides, this ancient arrangement was upset. Throughout the Everglades, gator holes filled in and dried up, no longer serving as centers of life. The area's hydrology suffered, and the whole system was weakened. Meanwhile fishermen complained that the fishing in the Everglades was not what it used to be. Bass and other sport fish were being devoured by spotted gar fish, whose numbers were increasing every year. What had been keeping the gar in check? Their natural predators, the alligators.

Remove any element of a natural system like the Everglades and the system may be weakened. But maintain a system's natural diversity, and it can withstand severe strains. Diversified, healthy ecosystems tend to have many overlapping systems of checks and balances. Such redundancy buffers the system against the impact of any particular change or stress. When American farmers replaced diverse native prairies with vast monocultures of single species of corn and grain, they helped set the stage for the dust bowl of the 1930's. In parts of the Midwest it was only the remnant areas of natural prairies that kept the soil intact during that terrible drought.

Indeed, the reduction of diversity is almost always expensive. When we spray a neighborhood for mosquitoes, for example, we kill or drive away many of the mosquitoes' natural predators. Meanwhile we breed a race of mosquitoes resistant to insecticide. Then we have set ourselves up as the perpetual guardians of that area, expending time, money, and ingenuity to keep the mosquitoes down and the system going. Otherwise, with natural controls reduced, the mosquitoes will return ten-fold and more savage than ever.

THE SECOND ARGUMENT for diversity hinges on the unpredictable benefits we derive from single species. For example, France's finest grapes grow on root stocks imported from America. Because these root stocks produced a grape that was inferior for eating or wine-making, Americans were rapidly eradicating it. Then a virulent insect infested the roots of European vines—and because the American roots resisted the insect, fine European vines were grafted onto them, saving the European wine industry.

Such ecological rescues happen often. American wheat farmers, for example, need new varieties of wheat every 5 to 15 years to adapt to changing conditions, including new pests and diseases. Hardy *wild* strains are important genetic reservoirs for those new varieties. In fact, most modern agriculture is balanced precariously on very few varieties of plants—one kind of soybean, four varieties of potato, two rices, two peas, one coffee tree, and so forth. All these crops are vulnerable to decimation by a single pest, disease, or climatic change. If a modern crop does not have its wild relatives to rejuvenate or replace it, the ensuing disaster could cause the demise of large populations of the human race.

In addition to food resources, the potential pharmaceutical usefulness of wild plants, animals, and microorganisms is immense. For example, some species of the Ethiopian plant genus *Maytenus* produce substances called maytensines, which show promise for the treatment of cancer. Unfortunately the Ethiopian plants produce this substance in such minute quantities that researchers originally had trouble collecting enough for experimentation. They searched for another species that might produce maytensines in more quantity. They found it in Kenya, in a rare plant that had been protected by chance in a forest reserve. Results of new tests were more promising than ever, and researchers needed a still more productive source of maytensines. Once again a forest reserve yielded the right plant, this time in South Africa. This species, which the world would never

Tropical forest, Venezuela. It is estimated that nearly half of Earth's species live in rain forests, which are dwindling by at least 13 million acres every year. Some 85 percent of the ecosystem's abundant flora and fauna has not yet been catalogued by science. . . .

have known if it had become extinct earlier, is now a major target for conservation.

Almost half of our medical prescriptions contain drugs of organic origin. Some of those organic compounds cannot be synthesized. Most of those that we can synthesize are still obtained more cheaply from their natural sources. And since many of the most important plant sources have not been successfully domesticated, we have to find them in the wild to get their benefits. Despite the rich rewards, we have investigated only some five percent of the world's plant species for pharmaceutical products. Meanwhile another species vanishes every day, and we are none the wiser. The unpredictable yet undeniable utility of living species is sufficient reason for caring about such things, for a species is truly useless only when it is extinct.

THE THIRD ARGUMENT for diversity might not seem as practical as the first two. Yet it illuminates problems every bit as real and as far-reaching in their consequences. Human beings seem to have an innate need for natural diversity, and to be deprived of it pains even the staunchest lover of cities, consciously or unconsciously. Early man evolved in a diversified savanna-forest habitat. Our ancestors were especially fit for the diversified environment at the edge between forest and grassland. That predisposition lives on in modern man. Any natural place that people call beautiful is almost certain to be a diversified, healthy ecosystem, whether it be a marsh, a prairie, a desert, or an alpine meadow. Variety *does* seem to be the spice of life.

Even if we could substitute a totally artificial environment for the natural one, something would be missing. What would it be like to adapt totally to the products of other human minds? For most of us it would be a nightmare, because we need to perceive an autonomous reality that includes us but is outside us. As one of Bertolt Brecht's characters put it, "We city-dwellers get dazed from never seeing anything but use-objects; . . . trees, at any rate, have something independent about them outside myself." Anyone who has felt a mountain's indifference to human events will understand those words. We need to be reassured that something is firm and permanent. Such reassurance depends on the presence of natural diversity, which manifests the complexity and mystery of natural reality.

When people talk about going to "the country" for a vacation, they do not mean simply getting out of town. They mean finding some version of diversity. A corn field may be natural, but it is also monotonous, and hardly anyone vacations there. For reasons of their own sanity and well-being, people need a holistic, organic perception of their milieu and their place in it. Prolonged monotony of any sort produces neurosis, for which cultural and natural diversity are the only effective defenses.

THE FINAL ARGUMENT for diversity was developed most eloquently by Aldo Leopold in his classic essay "The Land Ethic." *Homo sapiens* lives under the same ecological constraints as any other species. If we ignore the ecological facts of life and act as if we really had conquered nature, sooner or later nature will get even. Our best strategy is to adopt an attitude of humility and respect. That attitude allows us both to be true to ourselves as natural creatures and to exercise human, rational choice in the most prudent way. "In short," Leopold wrote, "a land ethic changes the role of *Homo sapiens* from conqueror of the land-community to plain member and citizen of it. It implies respect for his fellow members, and also respect for the community as such." A workable land ethic requires that we understand the consequences of our actions on other species. It further requires that we acknowledge the right of other species to continue their existence and to do so in a natural state.

Of course one could argue that ethics apply only to people. Nevertheless, because the web of diversity connects us all, the ethical problems persist. If a farmer drains a marsh in order to replace its abundant diversity with a monocultural empire of soybeans, then quite possibly he has done me some ecological harm. I am entitled to ask by what right he does so and why his rights should supersede mine. If, in addition, the soybean industry happens to extinguish a species or two, it has denied the rest of us an irreplaceable genetic resource. The eradication of an element of diversity can be a violation of the rights of a great many people.

The remedy, as Leopold summarized it, is to "quit thinking about decent land-use as solely an economic problem. Examine each question in terms of what is ethically and esthetically right, as well as what is economically expedient. A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise."

EACH OF THESE four arguments makes a good case for preserving genetic diversity. Each has convinced many people. Yet cogent arguments alone may not be enough. These arguments have been around for decades, but the rate of species extinction continues to grow exponen-

Oil from the seeds of Baker's meadowfoam (Limnanthes bakeri, *above*) *and other species of this West Coast genus could replace sperm whale oil in industrial use. Three meadowfoam species and five varieties or subspecies are currently under review for federal listing.*

tially. In the final reckoning, the preservation or loss of natural diversity may depend on impulses stronger than reason. The nonrational forces destroying diversity are familiar to us. In some cases, people who have power also happen to be greedy, stupid, or malevolent. In other cases, genuine humanitarianism can lead people to sacrifice natural diversity to immediate needs for food, shelter, and energy, no matter how unnecessarily or shortsightedly. Yet not all our impulses are destructive. We do have within us the will to save natural diversity. The trick is to find ways to act on that will.

To illustrate, I offer an example that might seem far-fetched. Yet its very remoteness is what makes this example pertinent. It shows how deep and pervasive is our impulse to save diversity.

In the early 17th century, a brilliant Englishman named Sir Robert Cotton amassed a great collection of ancient books and manuscripts. Unfortunately most of them were written in half-forgotten early English. Since neither he nor any of his contemporaries could understand the books very well, Cotton needed an unusual classification system. It happened that busts of Roman emperors stood at intervals on top of his library shelves, and so he named his manuscripts according to the busts they sat beneath, numbering each book according to its shelf and its place on the shelf. One of those books sat beneath the Emperor Vitellius and is still known as Cotton Vitellius A XV. It later became one of the most famous single volumes in the Western world, the only known text of the great Old English saga *Beowulf*.

By the time Cotton got his hands on it, Vitellius A XV already had a long history. We now know from its language that the manuscript was written around 1000 A.D., but it contains words from the 8th century and refers to at least one historical event in the 6th century. The saga has all the earmarks of an oral poem like Homer's *Iliad*. Such poems are kept in people's memories, passing from generation to generation, changing gradually to accommodate social and political changes. By the time our scribe wrote it down, parts of the poem were already centuries old. The scribe himself must have been a monk. No one else could write, or could command so much parchment. Nevertheless, the poem is blatantly pagan, despite some passages of Christian sugar-coating. God only knows why some anonymous monk wrote the 32,000 lines or how he justified his labor to his abbot. Yet we are lucky that he did. A couple of generations later, in 1066, the Normans invaded England and changed history. Under French rule,

Old English language and literature withered away. A century after the Conquest, hardly anyone would have been able to read *Beowulf*, let alone memorize it.

For the next 500 years the unintelligible manuscript lay in English monasteries, escaping fire, theft, flood, worms, and mold. Then Henry VIII celebrated his break from the Church of Rome by burning English monasteries to the ground and their libraries with them. Someone, perhaps a certain Lawrence Nowell, Dean of Lichfield, rescued Vitellius A XV from the flames, for reasons we will never know.

When the manuscript showed up in Cotton's library a century later, its travels and troubles were not over. The entire library was moved to Westminster College where, in 1731, a fire destroyed or damaged much of the Cottonian collection. The fire only scorched Vitellius A XV, but its charred edges became brittle and started to flake away. No one yet understood the manuscript very well, but some thought that it was an old Danish epic. With that in mind, an Icelander named Thorkelin made two copies of the poem in 1787, thinking he was preserving part of his Danish heritage, reconstructing words at the edges of the pages as best he could. It is well he did, because much more of the manuscript has disintegrated since then. Finally the first printed text appeared in 1815. Many new editions have followed, like flowers from a single, ancient seed.

Why do we save things? The *Beowulf* text was rescued from extinction by several people at various times: the scribe, the careful monks, the person who snatched it from the burning monastery, Robert Cotton, Thorkelin. I would like to know what reasons they would have given for their efforts. I am sure of two things: their answers would have differed greatly, and not one of them would have known he was saving the poem for my enjoyment. Except for the original bards and the monk who wrote the manuscript, none of them even knew *what* he was saving. But each had his sufficient reasons.

WE WHO TRY to save species are the descendents of Sir Robert Cotton. In his time it was vitally important to save rare and endangered elements of intellectual and cultural history. In our time, it is our natural heritage that is in jeopardy. Like Cotton, we do not have a very clear idea of what is in our library. What is the genetic message in the long-toed salamander that is so important to save for future generations? We do not have the faintest idea. In fact, even if the salamander were vitally and specifically important to us now, we could not say what its importance will be to people of 2082 (to say nothing of the people of 3082, which would be closer to the *Beowulf* time-scale). We are trying to save as complete a library as possible. It is important to ask constantly why we do so. But beyond reason, the question is unanswerable. Saving diversity is important to us *because* it is important to us. It satisfies a need to be firmly rooted in the future.

Reduce diversity today, and you have reduced the range of information and choices available to our grandchildren. It is not easy to describe the extent of our obligation to posterity, and the question can get buried under a mountain of "what ifs." What should we save? What will future generations need or want? What would they miss? How much will they want it, so that we know how much we should be willing to sacrifice in order to save it? Against such uncertainties, the best we can do is hedge with diversity. Like Aldo Leopold's tinker, who does not understand the machine he is trying to fix, we save all the pieces. We save the full spectrum of present possibilities.

We have inherited a world of extraordinary variety and complexity in which people have survived and flourished for eons. No wonder we try to save its best and rarest parts. The impulse to safeguard one's heritage, and to pass it on, is common to people in all cultures. But today, as in the past, not everyone acts on that impulse. We may always depend on those whom Carl Sandburg called "the saving minority." By preserving what is precious and essential they save the rest of us. Even so, they cannot do their work unaided; they need institutions that support them and protect what they have saved. The Church once filled that role for ancient texts, as university libraries did later. We now face the difficult job of building new institutions that can shelter our diverse natural environment against ourselves.

Private organizations like The Nature Conservancy, federal agencies, statewide native plant societies, global organizations, and public and private agencies in other countries have the collective potential to institutionalize the preservation of natural diversity. Realizing that potential is our greatest challenge. If we succeed, we will not only keep alive other species and living systems; we will also keep alive what is best in ourselves. It is, after all, the human thing to do.

Jon Roush lives in Montana and is a member of the Conservancy's Board of Governors.

This article, part of which originally appeared in the Winter 1977 issue of the *News*, has been revised by Dr. Roush for publication in this issue.

CAN WE BANK ON GENE BANKS?

INSIDE A NONDESCRIPT research building at the San Diego Zoo there are two gray freezers upon which someone has placed a sign proclaiming: "Frozen Zoo: Twentieth Century Ark." Inside each freezer are hundreds of vials of frozen animal cells—mostly sperm, ova, and very early embryos of pygmy chimpanzees, Arabian oryxes, Przewalski's horses, and scores of other endangered species.

The keepers of this curious zoo consider their freezers to be gene banks—repositories of all the genetic information needed to recreate a species even after it has become extinct. If a species is nearing extinction or has already vanished, the keepers hope it will be possible to thaw out the frozen cells and, through the wonders of modern biology, regenerate the species. Extinction, this plan seems to suggest, need not be forever.

However far-fetched the idea may seem, it is not science fiction. When properly treated during freezing, the cells do not die. When thawed, they resume metabolism and live normally. Frozen semen and embryos are widely used in the livestock industry to propagate the genes of prize cattle or sheep. Implanted in the uterus of an ordinary female of the same species, thawed embryos develop normally. They will even thrive inside the uterus of a different but related species. For example, a Holstein cow at the Bronx Zoo recently gave birth to a gaur, a vanishing wild Indian bovid.

Though gene banking can, in one sense, do what the keepers of the frozen zoo say, it ignores one fundamental aspect of the problem of wildlife preservation. And because it does, gene banking can be considered only the narrowest and most desperate of alternatives.

Any species is more than the protoplasm within its skin. A truly natural species is the animal or plant for that matter, linked in a dynamic equilibrium with its natural environment. Take the bald eagle. It is an animal that lives in a certain way—the bald eagle way. It has its own set of behaviors—as much the product of evolution as its white head—for getting food, finding a mate, choosing a nesting site, rearing a brood. An eagle in a zoo, pecking dog food from a tin plate, looks very much like an eagle; but it is not a whole eagle, for it lacks its normal behaviors. A wolf pacing in a pen is a wolf in only the most limited sense. For being a wolf means not just having a certain appearance. The way of the wolf means living in packs that roam a vast area, hunting cooperatively, maintaining the pressures of evolutionary selection that predators apply to prey. These behaviors, practiced only in the wild, are as much a part of a species as its flesh and blood.

The frozen zoos may be able to recreate the protoplasm of an extinct eagle or a vanished wolf, but they can never reproduce a whole individual of any species because no amount of biological wizardry can discover and store away all the information needed to recreate an entire ecosystem. The only way to assure that there will always be eagles or wolves is to preserve the natural areas as they exist now.

Yes, there may well be times when an animal, gene banked in a zoo (either frozen or on the hoof), can be re-established in nature. The European bison, once extinct in the wild, has been restored to natural reserves by using animals preserved in zoos. (Frozen zoos would also have worked.) In most cases, however, the ecosystems, of which individual species are only parts, are far too complex to recreate. The very fact that many species will not reproduce in zoos is evidence that the captive animal is lacking something. Moreover, biologists seldom have any idea what that something may be.

The survival of most species as biologic wholes depends on a vast complex of environmental factors—specific soil types or geologic features, a precise mix of plant species, the competition from other species, and even the pressure of predators. Ecosystems that have taken many thousands of years to develop a biological community thriving in dynamic balance cannot easily, if ever, be recreated.

New advances in biology are giving humanity unprecedented power to manipulate the genetic core of living organisms, but these advances tell us nothing about how to ensure that there will always be whole eagles and whole wolves—and nothing about whole ecosystems. For the foreseeable future the only realistic course of action is protection of entire natural areas. At least then we will be able to provide homes for the animals regenerated from the frozen zoos.

—Boyce Rensberger

Mr. Rensberger is a senior editor of *Science 82* and author of *The Cult of the Wild,* an examination of attitudes toward wildlife conservation.

UP FOR REVIEW:

The Endangered Species Act

by William J. Chandler

IN 1978 NATIONAL ATTENTION was focused on the federal Endangered Species Act when the U.S. Supreme Court prohibited the completion of the federally sponsored Tellico dam in Tennessee because it would have exterminated the last known habitat of a small fish, the snail darter. The Secretary of the Interior had determined the fish to be in danger of extinction after dam construction had begun. The court ruled that the Endangered Species Act absolutely prohibited any action by a federal agency that jeopardized the continued existence of a threatened or endangered species or its critical habitat.

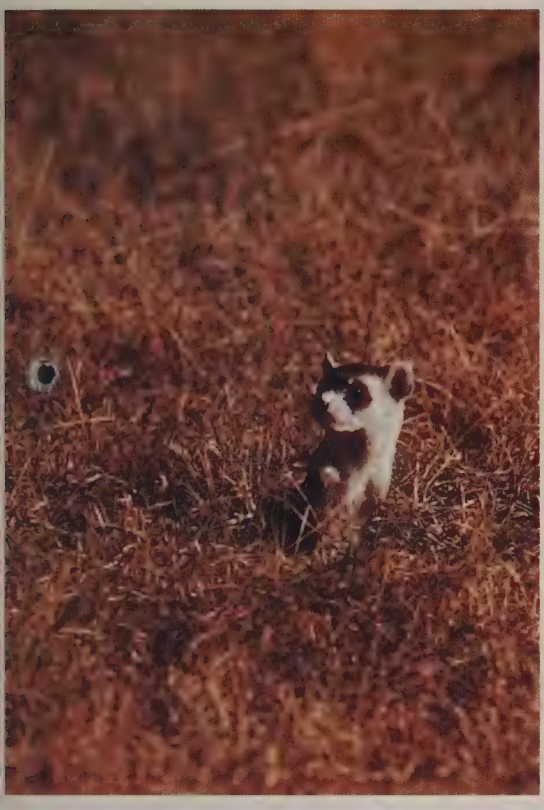
The ensuing controversy over the court's decision and the possibility of more like it impelled Congress to amend the Act to prevent conflicts between endangered species and federally authorized construction projects and to provide more flexibility in resolving those that did occur. A rigorous consultation process was created to force federal agencies to work more closely with the Department of the Interior to identify and preserve endangered species as early as possible in the planning of any federal activity. In cases where a federal project could not be modified to safeguard a species, Congress established an exemption procedure that would allow the activity to proceed, if the project's benefits clearly outweigh those provided by preserving the species. Although conservation organizations were uneasy about this escape clause, Congress believed that species vs. project conflicts would continue to occur and that failure to resolve them would cripple the Endangered Species Program.

Since the 1978 amendments were passed, the process of accommodating endangered species needs with federal development actions has worked well. No irresolvable conflicts have occurred and no exemptions have been granted to federal projects except for the Tellico dam, which Congress voted to finish. Nevertheless, neither development interests nor conservationists are totally content with the law or its implementation.

This year Congress is conducting another of its mandatory periodic reviews of the Act. Legislative authority for the Endangered Species Program expires September 30, 1982. Both the House Merchant Marine and Fisheries Committee and the Senate Environment and Public Works Committee must hold hearings and report new legislation reauthorizing the program to their respective houses by May 15.

While it is too early to tell exactly what specific changes Congress will seriously consider, a basic understanding of how the Act operates will enable readers to evaluate proposed amendments and to make their views known to their senators and congressmen.

THE PRINCIPAL PURPOSE of the Endangered Species Act is to preserve all species and subspecies of animals and plants threatened with, or in danger of, extinction in the United States and worldwide. The ultimate goal of the



legislation is to restore each endangered species to a point at which it is no longer in danger of extinction.

The Secretary of the Interior is responsible for administering the Act. Day-to-day administration is primarily conducted by the U.S. Fish and Wildlife Service, but the National Oceanic and Atmospheric Administration is responsible for marine species.

State fish and wildlife agencies play a key part in implementing the Endangered Species Program. The Act authorizes the Secretary of the Interior to sign cooperative agreements with these agencies and to provide them with matching federal funds to establish and maintain complementary species preservation programs. Thirty-eight states have programs for endangered wildlife, but only eleven have similar activities for plants. Since 1977, federal appropriations for the state programs have averaged $4 million annually.

BY FAR THE MOST IMPORTANT step in the program is determining which species are in jeopardy. Based on the best scientific data available, the Fish and Wildlife Service continually evaluates the biological status of numerous species to determine if they are threatened or en-

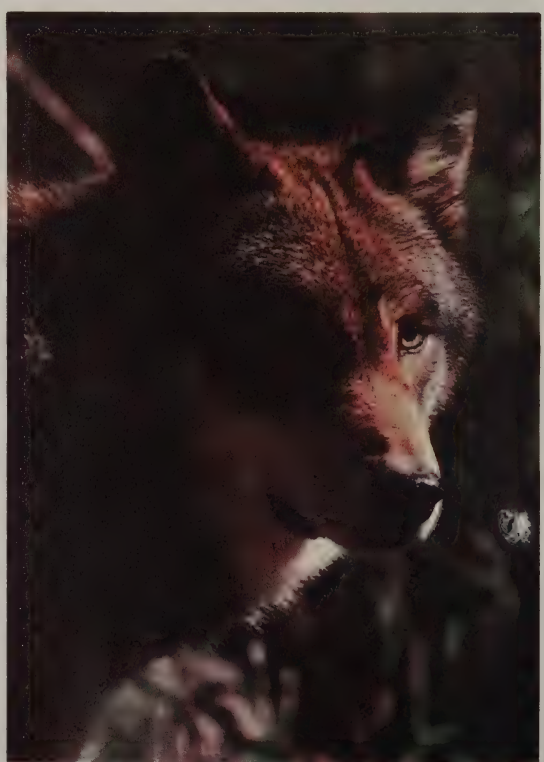
Both Mustela nigripes *(black-footed ferret) and* Echinocactus horizonthalonius var. nicholii *(Nichol's Turk's head cactus) are federally protected under the Endangered Species Act.*

The small whorled pogonia (Isotria medeoloides), *an orchid species proposed for federal protection, has been reduced to fewer than 500 individual plants.*

dangered with extinction over all or a significant portion of their range.

Once a species is determined to be threatened (likely to become endangered) or endangered (in danger of extinction), it is formally *listed* as such by notice in the *Federal Register*. At the same time the plant or animal is listed, the Secretary of the Interior must also identify and designate the critical habitat for the species, unless disclosure of the habitat's location could further endanger its occupant. Critical habitat includes those areas of land, water, and air required for breeding, shelter, feeding, and other essential biological functions.

The listing process is extremely complex, in terms of both the biological judgments that must be made and the procedural requirements that must be followed to allow public participation. In assessing a species' biological status, which may take years, the Fish and Wildlife Service considers a variety of natural and man-made factors affecting the organism, such as disease, natural predation, hunting, collecting, and habitat destruction. Once the biological review is complete, the species may be *proposed* for classification as threatened or endangered, and public comment is invited. Finally, about one year later, the species may be officially listed.



Canis lupus, *the endangered gray wolf, once ranged throughout most of North America; today, south of Canada, only one major population remains.*

The magnitude of the assessment task facing the Fish and Wildlife Service is staggering. So far, 756 species of U.S. and foreign species have been listed as threatened or endangered. Of these, 61 plants and 227 animals occur in the United States. Another 2,995 U.S. plants and 221 U.S. animals are considered prime candidates for listing but have not been proposed.

During fiscal years 1979 and 1980, the Fish and Wildlife Service listed an average of 46 species annually. However, during the first year of the Reagan administration, only three plants and one genus of Hawaiian snails have been added. This slowdown is explained by Department of Interior officials as a matter of priorities: the current administration wishes to focus program resources more on recovery efforts for U.S. species already listed rather than on the assessment process.

Once a species has been classified as endangered, it automatically receives certain legal protections provided by the Endangered Species Act. It is illegal to purchase or sell endangered animals in interstate or foreign commerce, or to kill, hunt, collect, injure, or otherwise "take" them. Interstate and foreign trade in endangered plant species is also prohibited, but plants are not protected from collection, injury, or other forms of taking. Criminal violations of the law are punishable by up to $20,000 in fines and one year in jail. Civil violations receive a maximum penalty of a $10,000 fine. Most individuals prosecuted under the law have been engaged in illegal trade for commercial purposes.

THE FISH AND WILDLIFE SERVICE is required to develop and implement a recovery plan for each listed species, endangered and threatened, foreign and domestic. As of December 15, 1981, the Service had developed 44 recovery plans for U.S. species, and another 49 draft plans are under review. A typical plan usually calls for a variety of management activities, such as habitat preservation, biological research, habitat manipulation, and law enforcement.

Managing a species back to ecological health often requires years of effort, especially when the organism is close to extinction. For instance, it has taken over 30 years to increase the number of whooping cranes from fewer than 20 individuals to more than 100 today. While some species will require similar long-term efforts, the most immediate task in arresting the decline of any endangered population is to protect its critical habitat through a combination of acquisitions, conservation easements, and land management practices compatible with the species' biological needs.

Caged for its own safety: the last known individual of the species Castilleja uliginosa, *currently under review for federal listing—but not yet proposed.*

For example, the last 100 to 200 members of the northeastern red-bellied turtle population are found around a series of ponds near Plymouth, Massachusetts. The recovery plan identifies 3,269 acres of critical habitat that must be protected to save the remaining animals. The Nature Conservancy has already acquired 182 acres. As the habitat is being safeguarded, the Fish and Wildlife Service will begin implementing other phases of the recovery plan. The ultimate goal is to establish a total population of 600 turtles (through artificial rearing and releasing of young), so that the reptile can be reclassified as threatened rather than endangered. Complete delisting is unlikely because of the red-bellied's limited range and numbers.

Averting further declines in U.S. endangered species populations is a formidable undertaking. During the period 1967 to 1980, the Fish and Wildlife Service acquired 70,617 acres at a cost of $42.6 million. The acreage provides critical habitat for approximately 30 species. Since 284 U.S. species of plants and animals have already been classified as federally endangered or threatened, the habitats now protected constitute but a fraction of the land needed to safeguard our country's dwindling fauna and flora.

A series of ponds in Plymouth, Massachusetts—two of which the Conservancy acquired in 1978—hosts the last population of endangered Plymouth red-bellied turtles (Chrysemys rubriventris bangsi).

THE ENDANGERED SPECIES ACT prohibits federal agencies from taking any action that jeopardizes the continued existence of a threatened or endangered species or that destroys or adversely modifies its critical habitat. To achieve this standard, the Act requires all federal agencies to *consult* with the Secretary of the Interior on the biological impacts of agency activities before carrying them out. By identifying the potential effects of a federal project on endangered species during the planning phase, alternative site locations or other modifications can usually be found, thereby preserving the species while permitting development. The consultation process is an extremely important conservation measure

since federal agencies play a major role in altering natural land.

The Fish and Wildlife Service conducts several thousand consultations each year. If the Service determines that a federal agency action is likely to jeopardize the continued existence of an animal or plant, the Secretary of the Interior provides the agency with a written *biological opinion* specifying how its proposed action affects the species or its critical habitat. The Secretary also suggests reasonable alternatives the agency can take to proceed with the activity while not harming the species. If a strategy for carrying out the project and also preserving the species cannot be agreed on, an irresolvable conflict exists and the federal agency may apply to a cabinet-level committee for an exemption from the law. If the committee then finds there are no reasonable alternatives to the proposed agency activity and that the project's benefits clearly outweigh those of alternate actions that would preserve the species, the project is allowed to proceed.

From October 1979 to September 1981, the Fish and Wildlife Service conducted 9,673 consultations with other federal agencies, of which only 2,179 or 22 percent required detailed biological opinions. In most instances, either the Service determined that a federal action did not jeopardize a species, or ways were found to modify a project or program so it could proceed without significantly harming endangered life forms. Clearly the consultation process has worked well since it was redesigned by Congress in 1978.

AS RANDOM DESTRUCTION of the natural landscape accelerates, the concomitant loss of species poses grave risks to the proper functioning of Earth's biological systems and irreparably depletes the world's biological capital. According to Harvard biologist Edward O. Wilson, this "loss of genetic and species diversity by the destruction of natural habitats . . . is the folly our descendants are least likely to forgive us."

The major vehicle for preventing species loss in the United States is the Endangered Species Act. The current law authorizes the actions needed to deal with the problem: biological assessment and official listing of species, recovery planning and habitat protection, federal agency conservation responsibilities, financial assistance for state programs, and restrictions on illegal trade in listed species.

In reviewing the Endangered Species Act, Congress should focus its attention on ways to enhance the efficiency of the program's activities and to ensure adequate financial support for them. Three areas need particular attention. First, the biological assessment process is not keeping pace with the needs of imperiled plants and animals. Over 11 times as many U.S. species are waiting to be listed as have already been listed in the entire life of the Endangered Species Program. Yet in 1981, the U.S. Fish and Wildlife Service completed only four listings. A rational, scientifically objective assessment process that promptly identifies species in jeopardy is the cornerstone of the entire program. Furthermore, the listing process is not only critical to the protection of species, but it also affects and guides the voluntary efforts of state, local, and private conservation organizations. The process of determining a species' biological status should be unfettered by economic or political considerations and made more timely.

Second, all states must be encouraged by the Interior Department to develop cooperative programs for protecting endangered species, especially plants. Matching federal financial assistance is essential to developing these state programs. The current level of funding, $4 million, averages $80,000 per state, a pittance given the need. If provided sufficient monies, individual states could contribute immeasurably to the preservation of our nation's species diversity. Yet the Reagan administration recommended, and Congress approved, no funds to states for endangered species programs in fiscal year 1982.

Third, every effort must be made to ensure that recovery plans are completed for all listed U.S. species. In addition, their habitats must be adequately protected so that remaining populations are stabilized. Since it is clear that not all critical habitat can be purchased, the Department of Interior must design and employ strategies that include conservation easements, voluntary landowner management practices, and other innovative methods.

Although the U.S. Endangered Species Act was signed into law in 1966, it is only in recent years that the program's effects have been felt. The building blocks for a successful U.S. program to protect endangered species are now in place; we need not tamper with the structure. But it remains to be seen whether the federal government —working collectively with states, nonprofit conservation organizations, and private landowners —will use the Act to save imperiled species or merely to record their demise.

William J. Chandler is President of W. J. Chandler Associates, a Washington, D.C., firm that specializes in natural resource policy development and research. He formerly served as The Nature Conservancy's first legislative representative.

UPDATE:

The Nature Conservancy and Species Diversity

by Anne M. Byers
Associate Editor/Senior Writer

LOCATED NEAR THE TOWN of Cliff in southwestern New Mexico, the land that cradles the Gila River and its intermittent tributary, Mogollon Creek, has a lot going for it. For one thing, it embraces a splendid example of the Southwest's riparian habitats, an ecosystem that has been nearly obliterated. For another, these lush gallery woodlands have a guardian embodied in The Nature Conservancy. Protection of the rare site typifies what the Conservancy is doing to safeguard threatened and endangered species.

Though the tally for the area is not complete, scientists have already counted 350 plant species. Most are natives and, like their habitats, are in jeopardy. Here amid the cottonwoods, willows, Arizona sycamores and walnuts, the velvet ash, and groundsel, you'll find coatimundi, river otters, narrow-headed garter snakes, Sonora Mountain king snakes, and Gila monsters. All these creatures are classified as endangered in New Mexico.

Riparian habitats are often vital for relict fish species and a wide variety of birds. For example, the waters of Mogollon Creek and the Gila River support three state-endangered native fish—loach minnow, spikedace, and round-tail chub—as well as federally endangered Gila trout. Some 265 bird species nest or live in the verdant woodlands and surrounding desert of the lower Gila Valley. They include federally endangered peregrine falcons and bald eagles, and state-endangered species such as Mississippi kite, gray and black hawks, caracara, Bell's vireo, and sulphur-bellied flycatcher.

In late 1978 the New Mexico State Heritage Program recommended the Gila riparian ecosystem as a preservation priority. Then, early this year, The Nature Conservancy announced the initiation of its National Critical Areas Conservation Program—an all-out effort to identify and protect America's most critically endangered ecosystems. The southwestern riparian habitats, represented by the woodlands along New Mexico's Gila River, are one of many ecosystems that are in imminent danger of extinction.

Already some 127 acres of the 500-acre projected Gila River preserve have been acquired by the Conservancy, which holds a conservation easement on another 69 acres. To maximize its protection abilities, the Conservancy may negotiate management agreements with other landowners to safeguard additional sections of the ecosystem. The New Mexico Field Office is raising funds for the sanctuary's acquisition and stewardship.

The Gila Riparian Project is only one of 330 preserves The Nature Conservancy has created—or helped create—supporting plants, animals, or ecosystems that, because of their limited ranges or distribution, are nationally significant. The New

Mexico project also exemplifies the Conservancy's commitment to diversifying and refining its land preservation methods.

THOUGH SPECIES DIVERSITY may best be safeguarded through the outright acquisition of natural areas as sanctuaries, the Conservancy is faring well with a variety of other land protection methods, described at length in the September/October 1980 issue of the *News*. These techniques include landowner notification, natural area registration, designation, dedication, negotiation of leases, management agreements, rights of first refusal, and conservation easements. All are now in use nationwide.

As of late fall, 1981, the Indiana Natural Areas Registry was proclaiming a success rate of 75 percent. Over 130 natural areas are now registered under a program in which landowners agree to protect certain rare features on their properties and to notify the Conservancy should they ever decide to sell their lands or cancel the agreements. Indiana's success has spawned plans for similar registry programs in Maryland, Minnesota, Iowa, Colorado, Washington, and Massachusetts.

To date, the Conservancy has obtained some 85 conservation easements across the U.S. Such easements enable landowners to donate property for conservation purposes—meaning they relinquish development rights—while retaining actual ownership as well as subsurface oil, gas, and mineral rights. One of the last unspoiled riverine systems in northern Wisconsin (see page 27 for a detailed description of the project), the Brule River and its surrounding woodlands are now protected by 16 different conservation easements encompassing 4,813 acres.

By alternating and combining various protection techniques, the Conservancy is better equipped to safeguard areas that support critical natural features, from endangered species to rare plant communities to vital habitats. At the same time, the organization is more involved in preserve design than ever before. Creating sanctuaries entails not only selecting and protecting the best sites harboring the most critical elements of diversity, but also *designing* preserves: mapping them out, establishing boundaries so that areas can be adequately defended and maintained.

DIRECTLY PRESERVING LAND is not the only way in which the Conservancy works to secure the survival of critical ecosystems or besieged plants and animals. Pioneered by the Conservancy, state natural heritage programs across the country are continuing to identify rare natural features most in need of immediate protection and to specify the areas where these features can best be preserved. Since 1980, botanists with the Ohio State Heritage Program have rediscovered 12 plant species once thought extirpated in that state. Last summer Steve Bennett, coordinator of the South Carolina Heritage Trust Program, verified two populations of a reptile previously unknown in the state, the bog turtle. And in Indiana a population of the Kankakee mallow—only five populations are known to exist in the world—is being safeguarded by the state's Division of Nature Preserves and the Conservancy's Indiana Field Office. Preservation of the plant's site was recommended by the Indiana Natural Heritage Program.

Several heritage programs also have compiled "watch lists"—rosters of species not presently on a heritage list of rare, threatened, or endangered species. Plants and animals on the watch lists are those that must be periodically reviewed because the species are uncommon, declining, or rarely reported.

The data-gathering abilities of the heritage programs often surpass those of federal and state conservation agencies. Consequently, staff members of the Ohio and Michigan programs are revising and updating the states' lists of endangered and threatened flora and fauna. The Wyoming Heritage Program is presently being contracted by the Bureau of Land Management (BLM) to verify the existence of rare plants on BLM lands. In Arizona, professionals with the heritage program are completing reports for the U.S. Fish and Wildlife

The Conservancy's Gila Riparian Project.

The dots on this map of the contiguous 48 states denote Conservancy projects containing habitats for nationally significant species and community types. The animals and plants listed below, all of which are federally designated as threatened or endangered species, occur on these preserves—as do 70 plant species currently under review for listing.

Animals
American alligator
American crocodile
Atlantic Ridley sea turtle
Attwater's greater prairie chicken
Bald eagle
Blunt-nosed leopard lizard
Brown pelican
California clapper rail
California condor
California least tern
Cape Sable seaside sparrow
Delmarva Peninsula fox squirrel
Eastern cougar
Eastern indigo snake
Everglade kite
Eskimo curlew
Florida manatee
Florida panther
Gila topminnow
Gila trout
Gray bat
Gray wolf
Green sea turtle
Grizzly bear
Hawksbill sea turtle
Indiana bat
Key deer
Leatherback sea turtle
Loggerhead sea turtle
Peregrine falcon
Plymouth red-bellied turtle
Red-cockaded woodpecker
Salt marsh harvest mouse
San Joaquin kit fox
Southern sea otter
Texas blind salamander

Plants
Bunched arrowhead
Wild northern monkshood
70 other plant species that occur on Conservancy projects are under review for federal listing as endangered or threatened.

Top: endangered brown pelicans (Pelecanus occidentalis) *crest the crags at the Conservancy's Santa Cruz Island Preserve; above: bunched arrowhead* (Sagittaria fasciculata), *an endangered plant protected by the Conservancy at a North Carolina site.*

Service on the status of endangered species in that state. Meanwhile, the programs in Rhode Island, Massachusetts, and Indiana are providing information to local garden clubs for use in their campaigns to help protect threatened plants.

Some heritage staff people are working on or gathering data for Fish and Wildlife Service endangered species recovery teams. Deborah Crouse, a heritage program endangered species specialist, coordinates loggerhead sea turtle surveillance on North Carolina beaches, especially during the reptiles' nesting and hatching periods. The imperiled bayou darter has been getting a helping hand from the staff of the Mississippi State Heritage Program. And in Tennessee, Paul Somers, a heritage program botanist, is leader of the recovery team endeavoring to save the state's remaining purple coneflowers.

THE CONSERVANCY'S COMMITMENT to preserving biological diversity on a national scale is exemplified by the Endangered Hawaiian Forest Bird Project. More species of birds are threatened with extinction in the State of Hawaii than in any other area of similar size on Earth. Of the 58 bird species known to inhabit the islands' forest ecosystems, 29 are extinct and 23 are officially classified as nationally endangered. The goal of the Conservancy's Hawaiian Forest

Natural heritage program staffers have been instrumental in recovery efforts for both of these federally listed species: the threatened loggerhead sea turtle (Caretta caretta) *and the endangered Tennessee purple coneflower* (Echinacea tennesseensis).

Bird Project is to ensure the survival of viable populations of Hawaii's endemic avifauna by protecting representative examples of the forests upon which the birds depend. The Conservancy plans to establish, over a five-year period, 14 preserves encompassing 200,000 acres on five of the Hawaiian Islands.

In the past, the Conservancy sought to protect natural areas on a site-by-site basis, primarily acquiring undeveloped lands as they became threatened. Then, with the gradual establishment of heritage programs throughout the U.S. (there are now 28), statewide inventories began determining which areas are most ecologically significant. Elements of diversity (a rare animal, a representative plant community, an uncommon aquatic habitat), not the site itself, define a critical natural area. Today the Conservancy combines heritage program recommendations and a variety of land protection methods with a national perspective. The Rivers of the Deep South and the National Critical Areas Programs focus on the country's most gravely imperiled ecosystems. Preserving the best samples of these natural systems means that countless threatened or endangered species have a greater chance of surviving.

ECOLOGY FORUM

No. 43
by Robert E. Jenkins
Vice President, Science Programs

ENDANGERED SPECIES AND THE PRIMACY OF INFORMATION

Before anything can be done to safeguard endangered species, it is necessary to have a good bit of knowledge about them. One must know for sure which species are endangered, where they occur, why they're having difficulties, and what can be done about it. Under the Endangered Species Act, such findings are prerequisite to officially listing a species as endangered or threatened.

The same kind of information is needed by conservationists, in both the public and private sectors, to efficiently allocate their own voluntary protection efforts outside the scope of the Act itself. If handily available, such data can also serve resource managers and developers—guiding them toward planning options less damaging to endangered species. (Equally important for these purposes is information as to which species are *not* endangered. How else can sensible resource decisions be made?)

The actions of many such decentralized decision-makers to safeguard biological diversity are orders of magnitude greater in range and impact than the direct efforts specified by the Endangered Species Act itself. Because accurate species information is fundamental to all of these, its collection and dissemination are—without question—the most *cost-effective* investments we can make on behalf of species conservation. Given the clear primacy of species information, one might expect that the task of gathering, organizing, and managing it would have been attacked with the utmost vigor and dispatch. Surprisingly, it has not been so. The amassing of these data has been a slow and fitful process: we are still a long way from having the clear national blueprint for conservation that good information properly managed could provide. Why is this?

The proximal cause is obvious: too little money and manpower have been allocated to the task. A July 1979 General Accounting Office report to Congress on the Endangered Species Act was severely critical of the inadequacy of information collection and management activities. Among its observations on the subject, the report noted that, "Of the 323 . . . staff involved in the Endangered Species Program on October 1, 1978, only 18 were assigned primarily to the listing process." (Note: the listing process encompassed all actions for "obtaining and analyzing biological information" to justify listing of a species as threatened or endangered.) After 1978, a few more staff members were assigned to the task, and Fish and Wildlife Service regional offices undertook an augmented role in collecting data. But even today, there are only some 20 regional personnel assigned this primary responsibility and perhaps the same number in Washington.

To their credit, nearly $2-million worth of contracts for species status surveys has been funded over the last four years; but this is still grossly inadequate given the need to ascertain the nature of species endangerment across the nation. As for the professional biologists on the staff, there are very few—and paper work related to the listing process (the red tape that currently entangles it) commands a disproportionate percentage of their time.

Under Section 6 of the Endangered Species Act, "cooperative agreements" for endangered species protection have been established with individual states. As of November of 1981, agreements concerning endangered species of fish and wildlife (variously interpreted) had been set up with 38 of our 50 states—and agreements concerning endangered and threatened plant species in 11. Although many of the federally assisted state endangered species programs incorporate biological surveys and data-gathering efforts, budget requests currently before Congress include no allocations

for implementation of Section 6. This can't bode well for the cause of knowledge.

Fortunately, the official endangered species efforts under the Act are not the whole story on information collection and management. The 27 natural heritage programs developed by the Conservancy in cooperation with state governments now manage the most voluminous body of endangered species information in this country. Some of the programs are connected to state cooperative agreements under the Endangered Species Act, others are not. And additional state programs for endangered and non-game species have been compiling species data with *state* funds.

Several federal agencies outside the U.S. Fish and Wildlife Service have been giving it the old college try as well—the Bureau of Land Management and the U.S. Forest Service among them. In fact, under its resource planning programs, the Forest Service has probably channeled more time and energy into surveys of endangered plants on the national forests than the Endangered Species Program itself has expended on plant surveys generally.

In the private sector, native plant societies have launched rigorous research and species survey projects; museums and professional societies (like the Malacologists Union) have taken an intense interest in particular taxonomic groups and have worked to gather information on those groups nationally and internationally. This is all very well, but there are still many geographic and taxonomic gaps in the existing information—gaps the Office of Endangered Species could help fill.

Ultimately, there are two key reasons why more time and money haven't been devoted under the Act to the vital task of collecting and managing endangered species data. First of all, the aggregate dollar amount appropriated by Congress is never a lot, and by the time it's divided up among operations for listing, enforcement, recovery, and so on, no one of them is well-heeled. Information management per se hasn't been a high priority in many branches of the government (perhaps because it has often been done so badly)—so it's "business as usual" for the endangered species data collection task to lose out on its fair share.

Secondly, we haven't fully recognized how difficult and complex the information-gathering job is. Because there is an immense scientific community in this country, it is assumed that one need merely ask scientists to get the facts. However, only a fraction of those scientists are biologists, and few biologists are interested specifically in the status of plant and animal species, much less those that are threatened or endangered. Moreover, the idea that professional biologists should go traipsing around in the field recording what they find has lost respectability in recent decades—and most of what goes on by way of field work today is done by amateur naturalists. Though some of this work is superb, a good bit is of questionable reliability.

Even in the heyday of field biologizing, the information collected was not necessarily carefully husbanded. Much has been lost, and the remainder is badly scattered. Existing information is further flawed by incomplete records, imprecise locational data, misidentifications, sampling errors, and collecting biases. Even the best scientific papers may fail to indicate where, exactly, the field work was done. In summary: just pulling together extant information to find out what we think we know is a difficult and painstaking task.

Of course, integrating what already exists isn't all we need to do. Information gaps must be identified, new field explorations (or intensified secondary-source searches) mounted, field verifications of old records undertaken, and innumerable related tasks methodically carried out. A great many people and institutions are prepared to help with this work, but they need guidance, support, and some reliable organizing principles. Widely scattered biological surveys and on-again, off-again state cooperative agreements just won't do the trick.

It is possible that beyond, or behind, all of this, there is a sort of systemic flaw (a computer programmer would call it a "glitch") operating as an inherent impediment to endangered species data mastery. Because the ascertainment process is coupled with listing, and listing is directly connected to the imposition of strong regulatory protections under the Endangered Species Act, pro-conservation and pro-development forces have come to regard ascertainment itself as the first stage of their battle. This is to say, so much is at stake—so much follows from the simple assessment of a species' status—that various interests may consciously or subliminally act against the assessment process. Developers may be fearful of coming under the Act's prohibitions; resource managers may be fearful that serving as the Act's policemen—already a formidable business—will be impossible unless the number of actors and actions that must be restrained remains small and the case for restraint air tight. A fear of what full knowledge would require us to do, especially legally, to safeguard endangered species may have been translated into a resistance to full knowledge. After all, the strain on everyone concerned (and we are all concerned, in some sense) is reduced if actual list-

(Continued on page 30)

NEW PROJECTS

CALIFORNIA

Baldwin Lake (San Bernardino County). Pavement never looked so good. Conservancy acquisition of 97 acres on the north end of Big Bear Valley's boot-shaped Baldwin Lake safeguards the largest undisturbed stretch of "pavement plain" (a jeopardized ecosystem) left. The earth here—a mix of alkaline clay and cobbles of sarragossa quartz found only in this part of the San Bernardino Mountains—was pushed up to the surface by freezing and thawing in the Pleistocene. It fosters the growth of 14 plant species listed as rare and endangered by the California Native Plant Society, including slender-petaled mustard, California dandelion, and Big Bear checkerbloom. A top priority of the California Natural Diversity Data Base and the Conservancy's California Critical Areas Program, Baldwin Lake hosts a sizable wintering population of migratory waterfowl as well as bald eagles drawn here by mud hens to prey upon. The area is managed by the Southern California Chapter in cooperation with the California Native Plant Society and the U.S. Forest Service.

Desert Tortoise Preserve—Addition—(Kern County). Since 1976 the Conservancy has been working to extend habitat protection for desert tortoises (*Gopherus agasizi*) here in the Mojave Desert. The Southern California Chapter has acquired several tracts within the 38-square-mile Desert Tortoise Natural Area—1,460 acres all told, including this 20-acre purchase. The preserve's rich creosote scrub plant community (with more than 160 vascular plant species) sustains some 200 tortoises per square mile, a uniquely high concentration, and harbors the Mojave ground squirrel, listed as "rare" by the State of California. The land is managed by the Conservancy's Desert Tortoise Preserve Committee, which was founded by Dr. Kristin Berry, lead zoologist and wildlife biologist for the Bureau of Land Management's California Desert Program (see "Tortoises for Tomorrow" in the November/December 1979 issue of the *News*).

COLORADO

Snyder Riparian Bottomland (Morgan County). A 20-mile corridor of Platte River wildlands—riparian habitat luxuriant with marsh grasses, cottonwoods, and willows—is the State of Colorado's number one land conservation priority. In cooperation with the state, the Conservancy has acquired 460 acres here: three noncontiguous parcels on the north side of the floodplain, embracing bottomland sloughs, terraces, and wooded uplands. The area is a key migratory stopping place for bald and golden eagles, sandhill cranes, great blue herons, Swainson's hawks, great horned owls, and myriad songbirds. The lands have been conveyed to the Colorado Division of Wildlife for management.

CONNECTICUT

Hemingway Property (Town of Stamford). Topping a plateau above the east branch of the Mianus River, this one-acre gift of Booth Hemingway is forested in mixed hardwoods—shagbark hickory, locust, maple, and oak among them—with an understory of ferns and laurel. The property will be transferred to the Stamford Land Trust for management as a nature preserve.

John Sargent Woodland—Joan M. Gildersleeve Addition—(Town of Greenwich). A gift of William L. F. Gildersleeve and the estate of Joan M. Gildersleeve, this nine-acre tract brings Conservancy-protected land — freshwater marsh, spring-fed swamp, hills of northern hardwoods—to 14 acres. The property will be conveyed to the Greenwich Land Trust, for which the Conservancy has completed a natural resources inventory and a preserve master plan.

Sporn Property (Town of Stamford). Sadie Sporn has donated seven acres of mixed hardwoods grading from upland slopes of black birch, red and white oak, beech, and tulip poplar down to red maple and sweet pepperbush in wet lowlands. The bowl-shaped tract will be conveyed to the Stamford Land Trust for management.

INDIANA

Barker Woods Home Site (LaPorte County). Edged on three sides by the Conservancy's 31-acre Barker Woods Nature Preserve, a dedicated state natural area comprising relict swamp woodlands, this five-acre historic home site was a gift from the estate of Margery C. Barker. It has been conveyed to the National Audubon Society to house that organization's Midwest regional office.

Crooked Lake—Phil M. McNagny, Jr., Addition—(Whitley County). Purchase of a four-acre wetland parcel along the channel that joins Crooked and Little Crooked Lakes enhances this dedicated state nature preserve, protected in 1977 by the Conservancy in cooperation with the state, ACRES, Inc., and the Crooked Lake Property Owners Association. Glacial Crooked Lake, one of Indiana's deepest and cleanest, lies at the headwaters of the Tippecanoe River drainage. Its waters support most fish species indigenous to the region, including the cisco (a whitefish); its wooded margins and fertile wetlands support numerous birds, including eagles, as well as three state-threatened plant species (the knotted spikerush, *Eleocharis equisetoides,* and two pond weeds, *Potamogeton friesii* and *P. robbinsii*). The recently purchased tract has been transferred to the Indiana Department of Natural Resources (Division of Nature Preserves) for management. Conservancy-protected acreage here now stands at 100.

MINNESOTA

Howard Lake Heron Colony (Anoka and Washington Counties). There are 400 heron nests just 30 minutes from Minneapolis-St. Paul—and the Conservancy, in cooperation with the Minnesota Department of Natural Resources, has acquired them. The first acquisition made with funds from the department's new non-game wildlife "income tax check-off" program, the 1,301-acre wetland property holds two shallow lakes (Howard and Mud) and a cluster of nesting trees for great blue and black-crowned night herons. Considered a priority element of natural diversity by the Minnesota Natural Heritage Program, the colonial nesting site has state-wide significance, and the natural area is listed on the National Register of Historic Places for its Hopewellian Indian habitations and burial mounds. The land has been conveyed to the Non-Game Wildlife Program of the Minnesota Department of Natural Resources for management.

Regal Meadow—Addition—(Kandiyohi County). Lavish with small white lady's slipper orchids (*Cypripedium candidum*), this undulating, fen-like prairie in central Minnesota ranges from cattail marsh and sedge meadows on wet sites to little bluestem and typical tall prairie grassland in its drier precincts. The recent purchase of a 40-acre tract extends Regal Meadow southward, bringing its total acreage to 120. The Minnesota Chapter's preserve management committee handles stewardship.

MISSISSIPPI

Pascagoula Hardwood Lands—Addition—(George County). In cooperation with the State of Mississippi, the Conservancy has protected 45,000 acres of the meandering Pascagoula River's matchless bottomland hardwood forests and wetlands since 1976. The latest news is this 810-acre addition of pine-hardwood forest with oxbow lakes and frontage on the river itself. The Pascagoula basin is the yellow-blotched sawback turtle's only known location. It also hosts state-endangered rainbow snakes and Atlantic sturgeon, state-threatened black bears, and two species listed as "rare" in Mississippi—the swallow-tailed kite and the Gulf Coast glassy water snake. Because the Pascagoula is one of six rivers charted for protection under the Conservancy's Rivers of the Deep South Program, acquisition funds were provided by a Richard King Mellon Land Preservation Fund loan, to be repaid upon the property's conveyance to the Mississippi Wildlife Heritage Committee.

MISSOURI

Cedar Creek—Addition—(Boone County). A 109-acre parcel of largely open land adjoining the University of Missouri Wildlife Management Area has been acquired in cooperation with the U.S. Forest Service for inclusion in the Mark Twain National Forest.

NEW MEXICO

Gila Riparian Project—Additions—(Grant County). The Southwest's riparian habitats stand high on the Conservancy's list of national critical areas. Selected for protection by the New Mexico State Heritage Program, several private holdings along the Gila River and Mogollon Creek, its intermittent tributary, constitute a projected preserve assemblage for the New Mexico Field Office. The recent purchase of a 40-acre tract, coupled with the gift of a conservation easement on another 69, brings protected acreage here to 196. These lush gallery woodlands (vigorous sycamores and an extensive sweep of Fremont cottonwoods and Goodding willows) and surrounding desert country are a birder's dream: 265 species, 60 percent of all avian species found in the state and one-third of all found in temperate North America have been sighted here. They range from the nationally endangered peregrine falcon to the state-endangered Gila woodpecker. And there are state-endangered animals: coatimundi, river otter, Gila monster, and Sonora Mountain king snake among them. The New Mexico Field Office is currently $12,000 short of its $240,000 campaign goal for this outstanding project. (See page 18 for more on the Gila.)

Brule River

Ojibwa Indians, impressed by a spate of fires here five centuries ago, named the place "Burnt River." French explorers followed up with "Bois Brulé" or burning woods. The name held on (though these days it's pronounced "Brool") and so have nine major biotic communities in the upper watershed of this northern Wisconsin river: virgin pine forests, cedar swamps, alder thickets, lowland hardwoods, oak and pine barrens, aspen woods, and more . . . a 5,100-acre expanse undisturbed by intervening centuries.

Through its innovative Brule River Easement Program, the Conservancy has been busy keeping this nine-mile portion of the river wild. The targeted area is a string of private holdings within the Brule River State Forest.

"We're trying to come in ten years ahead of the problem," says Wisconsin State Director Russ Van Herik. And as far as costs go, the cause of conservation is coming out ahead: already 4,813 acres (95 percent of the project area) have been safeguarded through *gifts* of conservation easements from 16 owners. The largest of the properties is Cedar Island, where Coolidge made his "Summer White House" in 1928, drawn by the Brule's outstanding trout fishery. The land belongs to longtime Conservancy supporter John G. Ordway and his sister Sally O. Irvine.

A $15,000 grant from the Goodhill Foundation funded a comprehensive ecological survey of the project area in 1980. The result is an inch-thick report cataloguing the project area's superlative natural values. Just to hit the high points, it boasts: Wisconsin's largest undisturbed cedar swamp; a portion of Wisconsin's largest virgin white pine forest (with its largest individual white pine tree); high-volume feeder springs critical to the water quality of the river; 260 plant species, including the state-endangered tall white bog orchid; 90 bird species, including nesting ospreys and bald eagles (both state-endangered), Cape May warblers, black-backed three-toed woodpeckers, ruby-crowned kinglets, and seven other species listed by the state as "rare." In summary, this is the wildest, most ecologically diverse stretch in the river's 44-mile run north to Lake Superior.

The Wisconsin Field Office has established a special Brule River Easement Protection Endowment for long-term monitoring, research, and legal enforcement. It hopes to reach its $35,000 campaign goal for this, its most ambitious project to date, by the summer of '82.

NEW YORK

Beatrice S. Hoskins Woods (Ontario County). An abundance of regionally rare hackberry trees (*Celtis occidentalis*) gives this 28-acre preserve statewide significance. It encompasses a segment of the Canandaigua Lake Outlet with associated swamps and woodlands representing several late successional stages (including an old-growth stand of oaks). The area is habitat for gray foxes, white-tailed deer, beavers, pileated woodpeckers, great-horned owls, and a variety of waterfowl species. A gift of Beatrice and Lansing Hoskins, the tract is managed by the Central New York Chapter and used as a study area by the Community College of the Finger Lakes and Hobart College.

Wading River Marsh Sanctuaries—Addition—(Suffolk County). A gift of Lawrence C. Troeller and Gustav Scheulen, this two-acre salt-marsh tract fronting on Wading River is one of four small private inholdings targeted for Conservancy acquisition. Judged by the National Park Service's National Natural Landmark Atlantic Coastal Plain Theme Study to be one of two significant salt marshes on Long Island's north shore, Wading River serves as spawning and nursery habitat for many marine organisms and provides feeding grounds for shorebirds and waterfowl—including clapper rails, herons, and spotted sandpipers. The preserve assemblage, now 85 acres, is managed by the Long Island Chapter.

OHIO

Pickerington Marsh—Addition—(Franklin County). The character of this land—rolling terrain with ponds and marshes that swell and recede with fluctuating water levels—closely resembles that of prairie pothole country further west. Just 20 minutes from Columbus, it's a waterfowl haven, with 212 species counted (including such rarities for Ohio as the glossy ibis, European teal, whimbrel, and little blue heron). This 106-acre purchase buffers the existing 155-acre dedicated state nature preserve, which is managed by the Franklin County Metro Park District. The Ohio Field Office has set its fundraising sights at $550,000 for the addition.

OREGON

Sandy River Gorge—Addition—(Multnomah County). Nineteen acres skirting a big gravel riverbar, this addition is wilderness a half-hour east of Portland. Lodged within the steep-walled Sandy River Gorge, the property bears moist Douglas fir and western red cedar woods and a floodplain forest of black cottonwoods and red alders. The area hosts osprey, elk, and river otters; and the river itself—a designated state scenic waterway—boasts a sizable winter run of steelhead trout. The existing 350-acre preserve borders this addition on three sides, Bureau of Land Management (BLM) land on a fourth. Sandy River Gorge is managed by the Oregon Field Office's Sandy River Gorge Committee.

PENNSYLVANIA

Woodbourne Forest and Wildlife Sanctuary—Addition—(Susquehanna County). It's the largest remaining tract of virgin forest in northeastern Pennsylvania. By purchasing an 18-acre tract that had been subdivided and slated for development, the Conservancy has enhanced watershed protection for the existing 631-acre preserve. Other ecological attractions include Cope Pond, featuring floating sphagnum islands on which bog plants such as leather leaf, sundew, and pitcher plant grow, and a 16-acre alder swamp supporting more than 85 plant species. Dominant tree species at Woodbourne are eastern hemlock, American beech, and red maple—with hobblebush and striped and mountain maple in the undergrowth. Nine species of salamander occur on the preserve, as do occasional river otters and snowshoe hares. Managed by a preserve committee and resident naturalists, Woodbourne is open to the public. The Eastern Pennsylvania Chapter has $10,000 left to raise toward its $25,000 campaign goal for stewardship and acquisition funds.

SOUTH CAROLINA

Flat Creek Diabase Dike (Lancaster County). Protected: the thickest diabase dike in the Americas. (For the non-geologist, a diabase dike is a flat, vertical intrusion of fine-grained igneous rock injected while molten into a fissure in another rock body.) This 150-acre area's soils, including the base soil of the dike itself, promote the growth of several state-protected plants—purple coneflower, burning bush, Puck's orpine, *Cyperus granitophilus* (a sedge), and *Portulaca coronata* of the purslane family. It is also the only known South Carolina location for papoose root (*Caulophyllum thalictroides*). Thanks go to a southern paper products company that donated 75 acres to the Conservancy and plans to donate another 75 in the coming year. The South Carolina Field Office currently manages the area.

WASHINGTON

Jack Island (Skagit County.) Rocky cliffs and white shell beaches ring this densely wooded island in the San Juan Archipelago—a nesting site for federally endangered bald eagles. A conservation easement on 18 acres here, primarily red-cedar/grand fir/

Douglas fir forest, was an anonymous gift. The Washington Field Office has long been involved in safeguarding San Juan islands; its successes to date include Goose, Deadman, Sentinel, Yellow, and part of Waldron.

WISCONSIN

Baraboo Hills Project/Baxter's Hollow—Addition—(Sauk County). A gift of Robert J. Fausett, this 80-acre parcel is the southernmost addition to the Conservancy's assemblage here in southern Wisconsin. Encompassing half a mile of Otter Creek, a pure cold-water trout stream used extensively for aquatic invertebrate research, the tract supports the state's highest diversity of caddis fly populations. Forest types grade from wet mesic along the creek itself through northern forests of white pine and red maple to xeric oak woods on the bluffs. The Baraboo Hills area, notable for its mix of northern and southern plant communities, has been a Wisconsin Chapter project since 1963. Conservancy protection here spans 1,942 acres in nine preserves. Baxter's Hollow itself, now 449 acres in toto, is managed by the Wisconsin Chapter's stewardship committee.

Puchyan Prairie (Green Lake County). A top conservation priority of the Wisconsin Scientific Areas Preservation Council, this 120-acre property ranges from oak forest to low prairie and sedge meadows to an extensive mosaic of cattail-bulrush-burr reed marshland. The prairie parsnip (*Polytaenia nuttallii*), a state-threatened plant species, flourishes here, as do yellow-headed blackbirds, green herons, American bitterns, king rails, black terns, Henslow's sparrows. . . . Puchyan, charted for designation as a state scientific area, will be leased to the Wisconsin Department of Natural Resources through the Nature Foundation, which financed its purchase.

PARRAMORE ISLAND GUARDIAN
A Limited Edition
Fine Art Collector Print
by John M. Barber, ASMA

In 1980, when The Nature Conservancy began a campaign to raise $1.1 million to establish the Virginia Coast Reserve Island Protection Fund, John M. Barber, a nationally known marine painter, was commissioned to create an original painting that portrayed the barrier islands. The resulting "Parramore Island Guardian" has been issued as a limited edition of 250 signed and numbered lithographs.

In recognition of your tax deductible contribution of $100 or more, you will receive a registered copy of this magnificent collector print, available only to supporters of the protection of the Virginia barrier islands.

Prints numbered 111 through 250 will be given to donors of $100 and will be signed and numbered by the artist. Prints numbered 21 through 110 will be offered to donors of $500 and will be signed, numbered, and personalized by the artist with a brief inscription of your choice.

Prints numbered 1 through 20 will be offered to donors of $1,000 or more. Prints will be numbered, signed, and remarqued by the artist, embossed with the Conservancy's seal, and framed. "Museum mounting" procedures have been followed to assure archival quality.

Send donations to: Stewardship Department, The Nature Conservancy, 1800 N. Kent Street, Arlington, Virginia 22209. (For $500 prints please note the inscription you would like).

In most cases, prints will be sent by United Parcel Service.

Continued from page 24

ing does not occur. As various interests ratchet up the requirements for listing, a greater and greater part of the Act's scarce appropriations is consumed in the listing procedure itself.

This is not good for endangered species . . . and, in the end, it isn't good for anyone. If the scientific data process grinds to a halt, we will be dooming ourselves to blind decision-making on the use of our nation's lands and waters.

What needs to be done? First, the Act must be reauthorized. Second, sufficient funds must be appropriated to support information-gathering efforts under the program, both internally and through cooperative agreements with the states. If something must be shortchanged in a tight budget, it should *not* be information. It might be argued that listing can sometimes wait (and it has), protective land acquisition can sometimes wait, recovery actions can sometimes wait; but until the information is in hand, all of these—and the cause of species preservation itself—*will* wait.

LACAWAC EXPERIENCE
August 1982

Lacawac Sanctuary is a unique wilderness within easy reach of most eastern urban centers. Its central feature, an undisturbed glacial lake, is a National Natural Landmark. The entire sanctuary, including the lodge, has been placed on the state and national Registry of Historic Places. A Conservancy model preserve, Lacawac has for years been operated as a research and learning center. Now, from Sunday, August 22 through Saturday, August 28, 1982, the quiet beauty of Lacawac is being made available to a limited number of participants—not more than 15 people. Time for relaxation and candlelight dinners will frame a delightful learning experience. Sanctuary staff and guest specialists will be available to help unlock the wonders of the natural world. This 7 day, 6 night opportunity is available for $750 per couple, of which $300 is a tax-deductible contribution. (Based on double occupancy).

For details and reservations, contact: Lacawac Sanctuary, R.D. 1, Lake Ariel, PA 18436; or call (717) 689-9494.

NEW LIFE MEMBERSHIP POLICIES ANNOUNCED

Pursuant to recent action by the Board of Governors, as of January 1, 1982, an individual becomes a life member of The Nature Conservancy upon a single contribution of $1,000 or more for membership dues *or* to any of the following permanent capital funds: the national Land Preservation Fund, the respective state Land Preservation Funds, or the national Guarantee and Income Fund. Furthermore, husbands and wives may hold a joint life membership for a single qualifying contribution. Upon request, current individual life members may elect to include their spouses as joint life members.

Exempt from all future dues renewal billings, new life members receive a special certificate of recognition and are listed in the *News*.

Is Your Estate Up to Date?

The Economic Recovery Tax Act of 1981 necessitates a review of your assets and how you plan to distribute your hard-won possessions. As you update your will—or create one for the first time—be sure to take advantage of the Tax Act changes. And, be sure also to consider the environmental impact which a bequest to The Nature Conservancy will carry. For information, please contact: Ms. Alice Pinsley, The Nature Conservancy, 1800 North Kent Street, Arlington, VA 22209, (703) 841-5374.

NEXT IN THE NEWS:
THE 1981 ANNUAL REPORT

The March/April issue will bring you 1981: an illustrated presentation of the places, programs, and events that made our 30th anniversary year the finest yet.

PHOTO CREDITS: Russell D. Butcher, p. 16; Mildred E. Faust, p. 14 top; Pierre C. Fischer, p. 13 bottom; Luther Goldman, p. 13 top; Terry Graham, p. 16; Jack Guggolz, p. 9; Bob Hansen, p. 21 top; Edward Harrison, p. 21 bottom; Michael-John Jaeger, p. 27; Paul Somers, p. 22 bottom; Phil and Judy Sublett, p. 14 bottom; Ken Taylor, p. 22 top; Karl Weidmann, p. 7; Steve Wilson (Entheos), inside front cover, pp. 4-5.

NEW LIFE MEMBERS

An individual becomes a Life Member of The Nature Conservancy upon contribution of $1,000 for membership dues. See opposite page for new policies on life membership.

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Dr. Hubert Caplan
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Donors of natural land, conservation easements, perpetual interests in natural areas, or irrevocable deferred gifts are recognized as Honorary Members for Life.

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A corporation becomes a Corporate Associate of The Nature Conservancy upon contributing between $1,000 and $10,000 annually to the operations of the organization.

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